A National Informatics Infrastructure for Pediatric Intensive Care

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Pediatric Intensive Care Units (PICUs) manage the most severely ill children encountered in health care. The complexity and variety of disease and the small populations of most PICUs, present many of the aspects of managing rare diseases. In addition, children rapidly deteriorate and information is required in a timely fashion to successfully respond to the pathologic impairment of critical illness. These characteristics make it difficult to comprehensively understand the pathophysiology of critical illness in children due to the sparse experience with any one condition (and age group) in any given PICU by any given small group of practitioners.

The Laura P. and Leland K. Whittier Virtual Pediatric Intensive Care Unit (VPICU) is creating a national infrastructure for capturing and sharing complex, granular, data sets among institutions providing pediatric critical care. This infrastructure is designed to capture and manage data related to diagnosis, treatment and outcomes of critically ill children. The VPICU will also provide the tools to analyze the data and determine patterns within the data as it is acquired. This will enable leading research institutions and hospitals to archive data, and provide access for remote PICUs, thus providing critical care providers with quality data sets for the purposes of comparison, datamining, pattern recognition and decision support.

The VPICU is collaborating with NASA's Jet Propulsion Laboratory (JPL) to build the distributed informatics infrastructure. JPL is leveraging both its software and experience building distributed scientific data management systems for planetary missions as the base infrastructure to support the VPICU. The software, the Object Oriented Data Technology (OODT), was developed by NASA as a reusable distributed framework for constructing ground data management systems for earth and planetary science. OODT, JPL's 2003 'Software of the Year', is not only capable of supporting NASA's planetary and earth science missions, but also in providing software infrastructure for the VPICU and potentially other biomedical data management projects. The VPICU has developed a common data model for describing pediatric data as well as an infrastructure for archiving data. The collected data consists of granular physiologic data (vital signs and vascular pressures), treatment parameters, laboratory results and physical observations relevant to the child's condition collected at intervals as frequent as every five minutes and gathered automatically by proprietary electronic records used in critical care units (e.g. Philips Medical Carevue). Member PICUs are able to extract, transform and archive critical data sets within the VPICU despite different clinical systems locally. The potential exists for additional institutions to archive their data within the VPICU and work towards creating a national knowledge infrastructure to support and improve the treatment and outcome of children entering the nation's PICUs.

The Object Oriented Data Technology software was developed by Jet Propulsion Laboratory under contract to the National Aeronautics and Space Administration.